

# Malden High School - 2014-2015

## Course Syllabus

**Name of Course:** Calculus AB

**Instructor:** Mr. Lippman

**Room:** A412

**E-mail:** [nlippman@malDENps.org](mailto:nlippman@malDENps.org)

**Extra Help:** Tuesday - Friday

*Please let me know during class if you are coming for help.*

### Materials:

|                  |   |
|------------------|---|
| Textbook         | TBD   |
| Student Supplies | 3-ring binder<br>Graphing Calculator → TI-83 plus or TI-84<br>Pencils<br>Colored Pens (Red or Blue) |

### Course Description: (From the Malden High School Program of Studies)

Prerequisite: Successful completion of Trigonometry & Pre-Calculus H, teacher recommendation, or approval of principal or director. This course is for highly motivated students who plan to pursue a career in mathematics or science. The subject matter is developed to meet the requirements for the Mathematics Advanced Placement Examination, which students are expected to take. Beginning with the limit concept, the course extends through differential and integral calculus. The curriculum followed in this course is set up by the Educational Testing Service and is used nationwide. The use of a graphing calculator is an integral part of the course. Students are encouraged to purchase a graphing calculator so they will become adept at using this technology. Extra calculators will be available for classroom use only. Recommended graphing calculators: TI-83 or TI-84 plus.

### Instructional Philosophy:

I believe that all students can learn at a high level if they are taught with a variety of instructional strategies. It is the goal of this course to not only build students' math skills, but also to build their confidence as math learners. In order to achieve these objectives, students will be expected to work individually, in groups and with technological resources to maximize their achievement. Students will have to demonstrate through traditional tests, quizzes, projects and participation in the classroom that they have developed the skills and knowledge necessary to meet the standards of a Calculus course.

The topics in the course will be presented using the Rule-of-4. This states that mathematical concepts can be understood:

- 1.) Graphically - presented visually through graphs and diagrams
- 2.) Numerically - presented in a table of values
- 3.) Analytically - presented symbolically in equations and expressions
- 4.) Verbally - presented in written and verbal descriptions

## Key Topics Covered:

### Limits and Continuity

3 weeks

- Limits - linear, polynomial, rational, trigonometric, piecewise, and composite functions
  1. informal approach (including one-sided limits)
    - a. numerical approach using a graphing calculator
    - b. graphical approach using a graphing calculator
    - c. algebraic techniques
  2. properties of limits
  3. limits and infinity, asymptotic and end behavior
- Continuity
  1. An intuitive understanding
  2. Definition
  3. Intermediate-Value Theorem

### The Derivative

7 weeks

- Rates of change
  1. Average rate of change
  2. Instantaneous rate of change
- Slope of a curve at a point and tangent line to a curve
- The derivative of a function at a point
  1. Limit of difference quotient
  2. Limiting value of slope of secant lines
- The derivative function
  1. Derivative of a function defined graphically, numerically, and by a formula
  2. Relating the graphs of  $f$  and  $f'$
- Differentiability and continuity
- Techniques of differentiation
- The second derivative
- Derivatives of trigonometric functions
- Chain rule
- Implicit differentiation
- Local Linear approximation
- Functions and their inverses - numeric, algebraic, and graphic connections
- Differentiability of inverse functions
- Derivatives of logarithmic and exponential functions
- Related rate problems

## Applying the Derivative

5 weeks

- Local Linear Approximation
- Analysis of functions
  1. Critical points, relative and absolute extreme values, increasing/decreasing, first derivative test, inflection points, concavity, and second derivative test.
  2. Relating the graphs of  $f$ ,  $f'$ , and  $f''$
- Extreme Value Theorem
- Mean Value Theorem and Rolle's Theorem
- Optimization

## The Definite Integral

5 weeks

- The integral as an accumulation
- Area under a curve
  1. Riemann sums
  2. Trapezoidal Approximation
- Integration by substitution
- The Fundamental Theorem of Calculus (part 1)
- The Fundamental Theorem of Calculus (part 2)
- Antiderivatives and indefinite integrals
- Properties of definite integrals

## Applications of the Definite Integral

4 weeks

- Area between two curves
- Volume of solids
  1. with known cross-sectional area
  2. of revolution - disks/washers, cylindrical shells
- Average value of a function

## Differential Equations

2 weeks

- Slope fields
- Separable differentiable equations

## Grading and Assessment Outline:

### Tests & Quizzes:

There will be approximately two major tests each quarter. There will be frequent quizzes in addition to these tests. These assessments will include a mixture of multiple choice and free response questions. Many of these will be questions directly from past AP exams and practice exams.

### Homework:

There will be homework assignments given almost every night. Some of these assignments will be "spot checked" as complete or incomplete and given credit. Others will be collected and scored for accuracy.

### Class Participation:

Students cannot successfully learn Calculus as spectators. Students are expected to participate in class regularly. Class participation includes the following:

- a.) Asking and answering questions in class
- b.) Presenting problems to the class
- c.) Working with classmates in small group activities
- d.) Taking notes, organizing your notebook and working through problems during class time.

| Category   | Percentage |
|--|------------|
| * Tests & Quizzes<br>* Major Projects<br>Ex: Free Response Assignments                         | 80%        |
| * Notebook<br>(notes, reflections, revisions, etc)<br>* Class Participation<br>(written, oral) | 10%        |
| *Homework<br>Ex: Assignments from the text<br>AP Exam Review Assignments                       | 10%        |